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Lichenostigma anatolicum sp. nov. (*Ascomycota, Lichenotheliaceae*) on a brown *Acarospora* from central Turkey

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Abstract — *Lichenostigma anatolicum* is described as new from the squamules of a brown, pruinose *Acarospora* sp. on gypsaceous rocks in central Turkey. It is compared here with three other species of *Lichenostigma* also known to occur on *Acarospora* spp. and *L. radicans* described on vagrant *Aspicilia* species.

Key words — biodiversity, lichenicolous fungi, lichens

Introduction

The lichenicolous genus *Lichenostigma* Hafellner was described by Hafellner (1983). It has a world-wide distribution and comprises 20 species (www.mycobank.org; accessed at 14 November 2008). Representatives of this genus are generally strongly host-specific, with the only exception being the type species, *Lichenostigma maureri* Hafellner, which is known from various fruticose lichens (e.g. Hafellner 1983, Halıcı 2008, Ihlen & Wedin 2008, Kocourková 2000). Halıcı (2008) previously reported five *Lichenostigma* species from Turkey, including the recently described *L. triseptatum* Halici & D.Hawksw. found on *Aspicilia* spp. (Halıcı & Hawksworth 2007).

During our studies of the biodiversity of lichenicolous fungi in Turkey, we collected a brown, pruinose *Acarospora* sp. on gypsaceous rocks from Central Turkey infected by a *Lichenostigma* species. The specimen was compared with three other *Lichenostigma* species also found growing on *Acarospora* spp. (Calatayud et al. 2002, Vondrák & Šoun 2007). We concluded that it is new to science and describe it here.

Material and methods

The type material of the new species is deposited in the herbarium of Erciyes University, Science & Art Faculty, Biology Department, Kayseri. Specimens were examined with an Olympus BH-2 research microscope fitted with Nomarski differential interference contrast optics and a drawing tube. Photomicrographs were prepared on a Nikon Eclipse 80i. Sections were prepared by hand and examined in I (Lugol's iodine, with [KI] and without [I] pre-treatment with 10% KOH), 10% KOH alone, and water. Ascospore measurements were made in water; Ascospore measurements are given as: ('min.' –)'X –sd'–'*X*'– 'X + sd' (–'max.'), where 'min.' and 'max.' are the extreme values, 'X' the arithmetic mean, and 'sd' the corresponding standard deviation. The length/breadth ratio of ascospore is indicated as l/b and given in the same way.

The species

Lichenostigma anatolicum Halici & Kocakaya, **sp. nov.** **FIGURE 1, 2**

MycoBank MB 512854

Differt ab alior species in generis Lichenostigmiis in filamentis superficialis desunt ad parce evolutis, Habitat supra thalium Acarospora *sp.*

Typus: Turkey, Sivas, Gürün District, Gökpınar, 38°39.071'N, 37°18.309'E, alt. 1620 m, on thallus of a brown *Acarospora* sp. on gypsaceous rocks, 05 August 2008, leg. M. Kocakaya (MGH 0.5471 – **holotype**).

Etymology: The epithet "*anatolicum*" refers to the geographical region Anatolia in Turkey.

Description: Lichenicolous, on the thallus of a brown *Acarospora* sp. Mycelium absent or poorly developed on the surface of the host lichen. Short root-like, pale brown hyphae, arising from the lower part of the ascomata and penetrating downwards into the host thallus, slightly branched with a single row of cells, up to 30 µm long, cells ± elongated to subglobose, 6–10 × 5–7 µm. Ascomata black, shiny, scattered, semi-immersed to superficial, cushion-like, rounded, not constricted below, 35–50 µm tall, 70–110 µm wide; in section, upper part ± flat; lower part usually penetrating into the host thallus and connected to brown vegetative hyphae. Internal structure stromatic, paraplectenchymatous, cells ± spherical, mostly 5–6(–7) µm diam.; external cells with dark brown walls, with a granular pigment, internal cells paler. Interascal filaments lacking, centrum I+, KI+ bluish. Asci fissitunicate, subglobose to broadly obovate, 8-spored, KI–, I–, 20–22 × 16–19(–21) µm. Ascospores irregularly arranged in the asci, broadly obovate, brown, constantly 1-septate, non-halonate, slightly constricted at the septum, in the maturity with a finely verruculose surface, (9.0–)9.2–*10.5*–11.8(–13) × (5.0–)5.5–*6.3*–7.0(–7.5) µm (*n* = 32), l/b = (1.5–)1.58–*1.68*–1.78(–1.85). Conidiomata not observed.

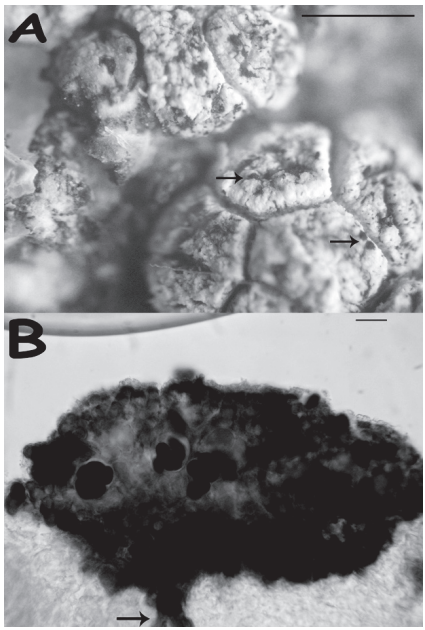

Fig. 1. ***Lichenostigma anatolicum*** (holotype). A. Infected thallus of *Acarospora* sp., B. Section of an ascomata, note the immersed brown vegetative hyphae arising from the lower part (arrow). Scales: A = 3 mm, B = 20 µm.

Fig. 2. ***Lichenostigma anatolicum*** (holotype). Ascus and ascospore outlines.

Ecology and distribution: The species is probably mildly pathogenic as it seems to suppress ascomata production in the host. No other damage to the host was observed. The new species is known from one locality from the central part of Turkey found growing on a brown pruinose *Acarospora* sp. on gypsaceous rocks. We inferred the host genus based on our familiarity with our lichen mycota and the presence of fertile *Acarospora* species on different rocks near the collection site. The host lichen might well represent *Acarospora cervina*, which is very common in the locality where this specimen was collected.

Observations: So far, three other species of *Lichenostigma* have been associated with *Acarospora. Lichenostigma* species growing on *Acarospora* spp. are compared in Table 1. *Lichenostigma anatolicum* is the only representative of subgenus *Lichenostigma* associated with *Acarospora*. Other species known to occur on *Acarospora* belong to subgenus *Lichenogramma*.

Table 1. Comparison of *Lichenostigma* species growing on *Acarospora* spp.

Character	*L. anatolicum*	*L. gracile*	*L. subradians*	*L. svandae*
Subgenus	*Lichenostigma*	*Lichenogramma*	*Lichenogramma*	*Lichenogramma*
Vegetative hyphae	Absent or poorly developed	Superficial, forming black ± orbicular groups	Superficial, forming black strands on the host surface	Superficial, irregular dark net-like patches
Position of ascomata	Semi-immersed to superficial	Superficial	Superficial	Superficial
Ascomata size (µm) (width × height)	70–110 × 35–50	45–120(–150) × 40–60	60–150 × 25–40	(50–)70–125(–160) × (20–)30–55(–70)
Ascomatal tissue	I_{Lugol} + bluish	I_{Lugol} –	I_{Lugol} –	I_{Lugol} –
Ascospores (µm)	9.2–*10.5*–11.8 × 5.5–*6.3*–7.0	9.0–*10.7*–12.0 × 5.0–*5.5*–6.0	9.0–*9.7*–10.0 × 5.0–*5.5*–6.0	11.7–*12.7*–13.7 × 6.5–*7.4*–8.3
Host	A brown *Acarospora* sp.	*Acarospora fuscata*	A yellow *Acarospora* sp.	*Acarospora cervina*
References	Present paper	Calatayud et al. (2002)	Calatayud et al. (2002)	Vondrák & Šoun (2007)

Lichenostigma svandae Vondrák & Šoun, a species recently described on *Acarospora cervina* from Ukraine and Czech Republic (Vondrák & Šoun 2007), has well developed superficial vegetative hyphae. *Lichenostigma svandae* also differs from *L. anatolicum* in having ascomatal tissue that is not stained by I+ blue and wider [(6–)6.5–*7.4*–8.3(–10) µm] ascospores (vs. (5–)5.5–*6.3*–7.0 (–7.5) µm).

The next two *Lichenostigma* species associated with *Acarospora* share similar ascospore sizes with *L. anatolicum*.

Lichenostigma gracile Calat. et al., which Calatayud et al. (2002) described on *Acarospora fuscata* on sandstone from Spain, is also known from Czech Republic (Peksa et al. 2007); *L. gracile* can be distinguished from *L. anatolicum* by its superficial vegetative hyphae that arise from a central point in a radial

pattern and ascomatal tissue that does not stain in I+ blue. Although the ascospores are similarly sized, *L. gracile* ascospores are occasionally 3-septate.

Lichenostigma subradians Hafellner et al., which was described on a yellow *Acarospora* from Arizona, USA, is distributed across dry areas such as Saudi Arabia, Canary Islands, and the Sonoran desert in western North America (Calatayud et al. 2002). Similar to *L. gracile, L. subradians* has also radially arranged, strongly branched superficial vegetative hyphae and ascomatal tissue that does not stain in I+blue.

In the lack of superficial hyphae, *Lichenostigma anatolicum* resembles *Lichenostigma radicans* Calat. & Barreno, a species described on vagrant *Aspicilia* species in Spain (Calatayud & Barreno 2003). In addition to living in different lichen hosts on different substrata, *L. anatolicum* differs from *L. radicans* by having I+ bluish ascomatal tissues, smaller ascomata [70–110 µm wide and 35–50 µm tall vs. 90–170 µm wide, 45–70 µm tall], usually superficial ascomata, and slightly shorter ascospores [(9–)10–*11.1*–13(–14) µm vs. (9.0–)9.2–*10.5*–11.8(–13) µm]. Table 2 compares *L. anatolicum* with other representatives of subgenus *Lichenostigma* (the most common species on saxicolous lichens, cf. Calatayud et al. 2004, Pérez-Ortega & Calatayud 2009, Thor 1985).

Table 2. Comparison of *Lichenostigma anatolica* with some other members of subgenus *Lichenostigma*.

Character	*L. anatolicum*	*L. dimelaenae*	*L. epirupestre*	*L. lecanorae*	*L. rugosum*
Vegetative hyphae	Absent or poorly developed	Absent	Absent	Absent	Absent
Position of ascomata	Semi-immersed to superficial	Superficial	Superficial	Superficial	Superficial
Ascomata size (µm) (width × height)	70–110 × 35–50	70–140 × 40–80	80–270 × 40–95 (–110)	120–300 × 120–200	50–200 × 30–50
Ascomatal tissue	I_{Lugol} + bluish	I_{Lugol} + pale red	I_{Lugol} + blue	I_{Lugol} –	I_{Lugol} –
Ascospores (µm)	9.2–*10.5*–11.8 × 5.5–*6.3*–7.0	11–15 × 6.5–11	11–*12.6*–14 × 6.6–*7.1*–8	10–15 × 6–9	10–13 × 5–7
Host	A brown *Acarospora* sp.	*Dimelaena oreina*	*Pertusaria pertusa* var. *rupestris*	*Lecanora farinacea*	*Diploschistes* species
References	Present paper	Calatayud et al. (2004)	Pérez-Ortega & Calatayud (2009)	Calatayud et al. (2004)	Thor (1985), Calatayud et al. (2004)

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